CAN WE IMPROVE THE CLIMATE OF CANADA?

By J. DALSTROM

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Comparative Climatology of Canada. — Operations on the Rockies.— The Great North, the Hudson Bay Route, Greenland, and the North Atlantic. — "Climaturgery," a coming Science, etc.

By J. Dalstrom.

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PART I.

COMPARATIVE CLIMATOLOGY OF CANADA.

Why has Canada only a Small Population on such a Large Area?

Canada is surely a good country, with tremendous resources and with a standard of civilization about as high as can be found anywhere on the Globe. A great variety of good things are found or produced in this country. Plans for development and progress are steadily evolved and carried out, probably in a larger measure during these last years than ever before.

Still there is a certain something here in Canada which at least the greater part of the population would like to have somewhat different, but nobody ever seems to have dreamt of that it can be remedied, and therefore loyal Canadians, who really love their country as their permanent homeland, will not give themselves to lamentations about it, but rather look on the good side of it. — What is that?

That is the climate, as far as it gives us long and cold winters and crop-damaging summer frosts! This cannot be denied, although we admittedly have a pure atmosphere and pleasant summers without excessive heat.

The climate of a certain country or territory is considered as something to which you must be resigned. People who do not like the climate at their place of abode, and who do not think they need to endure it any longer, simply move to a part of the world where it is more congenial.

But in that way some countries or territories seem forever doomed to have only a thinly scattered population, or to be well settled only in favored places and districts, with wide areas practically unoccupied, or nearly so. Other parts of the world, again, are overcrowded with human beings, of which millions spend their lives in poverty and misery, because the natural resources of their country were overtaxed long ago. Such is the case with India, China, Japan and some of the European countries. Because those nations are used to sustain life on a meagre supply of life's necessities, emigrants from there are not wanted in countries with more room within their borders, partly at least for the reason that they would lower the wages and the standard of living.

The countries of Asia and Europe are generally looked upon as "old" countries, being settled for thousands of years and therefore containing the overwhelming majority of mother Earth's inhabitants. But even with countries rather recently discovered, as those of the American continent, there is a marked difference as to density of population.

For instance, how does it come, that the land of Brazil, with an area not quite as large as that of Canada, has between three and four times as numerous a population as our country has? — Is it on account of a so much more vigorous immigration policy? Or is it because of greater opportunities for the average man to earn a decent living, or because of a better government, or a higher civilisation? — With all respect for Brasil, its government and its people, it is nothing of all that! The results of a comparison with Brazil in regard to these matters, same as with other countries, will be in favor of Canada.

What is it then that has made Brazil attractive to a so much greater number of people?

The fact that Brazil has a population of between thirty and forty millions, as compared with Canada's less than ten (at the time this is written, 1930), solely has its cause in the warmer climate of Brazil, even though the climate there really is too hot. The warmer climate attracts more people, in spite of many disadvantages of the heat, such as the earlier decay of food stuffs and other organic substances, also the nuisance of insect pests, reptiles, large beasts of prey, etc.

The United States has, in general, a temperate climate, a happy medium between the climate of Brazil and that of Canada, hence also a much larger population. As far as law and order, a good government, a practise of the golden rule, true freedom, control of vice, and similar things are concerned, our neighbor country to the south certainly has nothing on Canada. Further, in fertility of soil Canada is at least fully as richly endowed, and as to mineral and other natural resources the two countries are in about the same class.

But U. S. is warmer, that is why it has a larger population. (Whether a majority of the people of Canada would wish for a milder climate just in order that a larger population might settle here, may be a separate question. But be the inhabitants fewer or greater in number it is important that they should feel comfortable and really at home in the country.)

Heat is something people often appreciate more than it is worth, and there is often an unreasonable fear of cold. For instance, in a street car that is crowded to its utmost standing capacity on a cold winter morning, you seldom see any one open the top windows to let in the pure, health-giving air from the outside, although the inside air in the car is unfit for being breathed into the lungs, because it has been into many lungs already and is all used up and contaminated. The passengers don't seem to realize this. They merely

seem to be able to discern between the warmth and the cold, the great majority anyhow, although with the breathing of pure air your bodily heat increases, as compared with the breathing of such air from which the oxygen has already been taken.

However, the best climate is a temperate climate, not going to any great extremes of heat and cold during any considerable part of the year, allowing people to work outside at different occupations for at least eight or nine months out of the twelve, and where the bills for fuel and other protective means do not occupy an overproportional part of the family budget.

When people here in Canada have had many years of success in business, farming or some other occupation, they move to California or somewhere else, where it is warmer, either for the winter or for permanent residence. Others, who have failed more or less, have for that reason moved south, in many cases to Chicago or Detroit, partly because the working season there is longer. There is nothing to say against individual liberty in such matters, but when it amounts to an exodus on a large scale, it is enough to fill a loyal and true Canadian with regret. Legislators of opposite political parties have blamed each other for that undesirable exodus, and, of course, such a blame is not altogether unreasonable, as with good planning and earnest purpose surely more could have been done to keep some people from being unemployed for several months of the year. But, on the other hand, what legislation has there been done in Chicago or Detroit, or rather, in Illinois and Michigan, to similar purpose? (Just now a decided reaction seems to have set in over there, but that is only natural after so many years of great building activity.)

If the climate here would be favorable to eight months of outside work in the building trades, and legislation as well as private enterprise would do their best to provide some employment for the rest of the time, together with the fact that anybody can stand a few weeks of rest during the winter, if circumstances are that way, there would not be much of an exodus prevention problem. Beside that, Canada is a country with a natural poetic charm, a country that inspires a romantic love in its inhabitants, a love that still lives for long years after they have moved to some other country. There are thousands of young people who were born in Canada and spent their early school years here, but now live in the United States, who still consider Canada as their "homeland", and in their correspondence they tell of their yearning back to the beloved land of their childhood days. With thousands of older people the case is just similar, and most of them would have loved to stay here, if the all important bread question had not decided it different.

Now there comes the natural question: Can you really do anything to the climate?

Yes, there is at least a theoretical possibility. Whether it can and shall be carried out practically, is not for one man alone to say.

If decided in a positive way, it will, of course, be difficult and costly; but, I think, by combined, serious effort we can improve the climate, sooner or later, when we have amassed the full strength of knowledge of the premises, the proper system of engineering has been decided upon, and, last but not least, the finances of the country will allow it. However, the costs of a thorough scientific investigation of the matter ought not to be prohibitive at any time; and no actual improvement work would need to be started, until theories and plans were found scientifically satisfactory, so that the desired result could be guaranteed.

The Climate of Canada in relation to the Latitude.

Climatology teaches us, that the climate of a country or a territory depends on its latitude, altitude and distance from the sea. The most important of these three conditions is the latitude. When we look at a map to get the idea abot a country, we generally judge by its distance from the equator or from the North or the South Pole, how warm or how cold its climate is likely to be.

The question now before us is: How does the climate of Canada compare to the climates of other countries in the same latitudes?

The vastly greater part of this country, from the Rocky Mountains eastward, has decidedly colder and longer winters than the European countries on the same latitudes. (January and February 1929 in Europe was an exception in generations, and still the thermometer went down to lower Canadian winter temperatures only for a rather short time; but the people of Europe are not prepared for such eventualities, and therefore that cold spell caused so much damage and suffering. As a contrast, winter seemed to forget to put in its appearance in the northern European countries during the last months of 1929. When there is either an exceptionally cold or unusually mild winter somewhere on the northern hemisphere, you will generally find the opposite extreme holding sway somewhere else on this hemisphere.)

The winters of Northern Asia are decidedly harder than those of Canada. — But why should Canada be behind Europe in this respect? Certainly not on account of the fact that the Gulf Stream makes Europe warmer, as there are also similar currents in the Pacific, and the waters of the Pacific ocean are twenty degrees warmer than those of the Atlantic?

The Source of Cold of the Western Provinces.

The real cause of the low temperatures of Canada is, that we have a special source of cold or a polar region, so to say, right with us, far away from the North Pole. This western Canadian polar region is nothing else but the Rocky Mountains, with the Selkirks in-

cluded, as far as they reach, and perhaps, though to a far lesser extent, the high parts of the Coast Range of British Columbia.

It may be natural for people here in Canada to think of the North Pole or the north polar regions as the source of the cold temperature, or to be under a more or less vague impression that the wind from those regions brings us the cold weather. The north wind has been an object of much solemn or melancholy poetry, which may perhaps be more founded on actual fact in some other parts of the world than in Western Canada. Here the north wind may blow for a few hours, while the weather is changing, or sometimes for a day or two. After that either the south or the west wind will prevail. From the East the wind blows only occasionally, generally accompanied by misty weather, with a gentle fall of snow or rain. The prevalence of the west and the rarity of the east wind is the main reason why it is very much more difficult to cross the Atlantic in an aeroplane or a dirigible from Europe to this continent than from here to the Old Land, because from here the prevailing west wind assists the flight, while from Europe to here it presents an enormous difficulty.

The south wind gives us the warm weather here in summer time and the mild weather in winter. During the last months of 1928 we had some wonderfully mild and pleasant weather, caused by a steady south wind, and suitable to most of us, although as usual there are those who find fault even with the good things in life. Those whose particular line of business suffered from the mild weather we could not blame so much. But again we know there were many homesteaders who declared themselves fortunate, being able to do so much clearing and other initial work on their land; and it certainly was a great benefit to the poorer class of people, especially in the cities, in keeping down expenses for fuel and also for clothing.

Early in January 1929 the wind switched around to a steady west and kept on coming from that direction also in February, bringing us what was said to be for many years a record amount of "ice cream" from Jack Frost's manufacturing plants on the tops of the Rockies.

Purely theoretically, the solution of our climatic problem, of bringing us mild winters, would lie in two directions, either in making the wind blow perpetually from the south, or in moderating the cold of the west wind. Whether the former solution ever may come within the realm of human efforts, or even a theory be found for it, must be passed with silence just now, as nothing in that line is in sight. The solution of the climate problem presented in this booklet will relate to the west wind. In theory, this solution will here be made clear both directly and indirectly in different ways in this and the following chapters. The practical side will be treated in later chapters.

Whenever the weather was bitterly cold during other winters, as well as during the first months of 1929 and the winter of 1930, the wind has been coming from the West (except sometimes a few

hours or a couple of days at a time from the North). You could not change my opinion regarding this, as I have been crossing the Salter Street Overhead bridge on foot for eighteen winters and had the keenest experience of that when a sharp, cutting wind, like getting your face rubbed with fine sandpaper, during a temperature more or less below zero, made it extremely uncomfortable to walk across the bridge, so that you felt as if your face were getting burnt, from the intense cold — then the wind was coming in a most unmistakable way from the west, or westnorthwest. You could see the smoke from the C.P.R. switching engines and other locomotives coming from the same direction, so as to make sure there was no mistake.

Why should we have Colder Temperature coming from the West?

Now, let me ask the intelligent reader who has some knowledge of geography:

When we have a certain temperature here, should we get a distinctly colder temperature after the wind hat commenced to blow from the west? Should we really? Coming from territories on our own latitude, the wind from the west ought to bring us the same temperature as we had before — as long as there were no additional influence. Say, now, isn't that right? — This is a very important question. — Well, I have lived elsewhere where the west wind was mild; so have certainly many of my readers.

There is really a considerable influence that puts such a bitter chill into the wind that blows from the west out over the Prairie Provinces of Canada! It is the glaciers and the ice and snow clad peaks of the Rockies that make the climate of the vast country from these mountains eastward so much chillier than it otherwise should be, in summer as well as in winter. From the Rockies and Selkirks we get the damaging night frosts in summer time and the icy below zero temperatures during the winter. Not only that, but the winter begins from two to three months earlier east of these mountains and the real spring begins from two to three months later than west of the same mountains, the difference in the main being greater as you get near the Pacific coast in British Columbia.

During my twenty-five years in Canada I never heard anybody express a clear realization of this fact, as a relation between cause and effect, although the weather is by far the most common theme of conversation, often discussed from every angle you can think of, between friends as well as strangers. Consequently it looks as if it has not been clearly realized.

The Canadian Rockies, from the United States boundary northwestward constitute quite a polar region, if we so may express it. This polar region of ice, snow and cold is in the immediate vicinity of the western plains, and when the wind comes from the Rockies per-

hage ten times as often as from the northern regions (this statement is not claimed to be mathematically exact, but just somewhat approximate), it is not difficult to realize where our cold spells mostly originate.

The west wind, coming from the Pacific ocean, where the warm Japanese current washes the coast of British Columbia, remains warm and moist until it reaches the high mountains. As mentioned before, there are some very high mountains even near the coast, but they don't stretch very far north and south, the district they comprise is comparatively small (the real high Coast Mountains, I mean). It is not until you get toward the eastern boundary of British Columbia that you find a continuous high wall of mountains, from one end to the other of the province, in places up to sixty miles wide. For some three hundred miles the Selkirks and the Rockies are running parallel, separated by the narrow but deep Columbia River valley. Thus they form a double wall, shutting off the mild Pacific west winds from the plains of Alberta. Of the mountains which produce this undesirable effect many are from 7,000 to 11,000 feet high. The highest peak, Mount Robson, north of the rest of the really high ones, is 13,068 feet. But at Mount Robson the wall is thin, and from there northward it gets distinctly lower, almost abruptly coming down to between five and six thousand feet, which drop in height has the effect of making the climate of the Peace River country milder for its latitude than parts of Alberta further south.

Although the Rockies and Selkirks reach such great heights, they do not by any means shut off the west wind from blowing across the prairies. They are really only near the bottom of the atmosphere, comparatively spoken, so the west wind continues above their heads, so to say. But they shut off most of the warm west wind, of which only comparatively little, in the form of chinooks, mitigates the chilly atmosphere east of the mountains at times where it can slip through. The west wind that blows across the prairies comes, thoroughly chilled, from the ice and snow clad mountain tops of the Rockies and from glaciers as well as from the high strates of the atmosphere on and above these mountains, where the air is colder the higher you get.

That snow clad mountains produce cold weather in the adjacent lowlands is nothing peculiar to Canada. It occurs in other parts of the world just as well. In a letter from Shafter, California, dated January 26th, 1929, a former Manitoban wrote to a Winnipeg weekly, that they had to keep fire then and there in their thinly built houses. "This great cold", he added, "is caused by the mountains all around being thickly covered with snow."

In January 1929 there were great snow storms and an unusually cold wave occurring in Colorado, Kansas and other midwestern States, and it was expressly stated in the papers that this weather came

from the (American) Rockies. At Silver Lodge, Colorado, there was in February a snowdrift a hundred feet deep, which certainly did not have its origin in the lower country to the east!

However, as the theories presented in this booklet are new to the public, it is not to be taken for granted that it should be enough to prove them in just one way, far from it. In order to convince as far as possible, every reader, and to strengthen further the very important thesis of the Rockies constituting the cause of the chilly climate of the Prairie Provinces and neighboring parts of Canada, we shall also prove it by comparisons between different provinces and districts in this country as well as between Canada and different parts of Europe and Asia on the same latitudes.

British Columbia and Alberta.

Our two farthest western provinces are on the same latitudes, side by side. Still their climates are very much different. British Columbia (if you count the inhabited parts, not the high mountains) is the warmest province of the Dominion, and it has plenty of moisture to produce a luxuriant vegetation. In Alberta, again, the winters are characterized by spells of great severity, and in the southern part of the province, east of where the Rockies are more extensive, the summers are often too dry to allow such crops to be produced as the rich soil will give when there is enough of rain.

For being located side by side, the climates of these two far western provinces are so different, that the influence of the Rockies is most strikingly evident, the coast districts of British Columbia having a temperature in February as warm as there will not be on the prairies until about three months later. Even farther east in British Columbia the climate is much milder than in the other provinces, which fact the British Columbians do not seem to forget to mention, in correspondence and otherwise, to their friends farther east.

Even for such a short distance as from the western to the eastern or northeastern side of the Selkirks these mountains produce a very marked difference in the climate, although the distance is only from 40 to 60 miles right across. Howard Palmer in his "Mountaineering and Explorations in the Selkirks" expresses this fact as follows:

"The vegetation of the low valleys which bound the Selkirks varies considerably with their varying climates. That of the Columbia valley west of the range is essentially like the forests of the Pacific coast. The comparatively warm winters of this region and its fairly large rainfall produce conditions similar to those west of the Cascade Range and allow a similar vegetation to develop. — — —

"The Columbia valley to the northeast of the Selkirks is much colder, especially in winter, and somewhat dryer. Its winter tem-

peratures are considerably more severe than those which obtain several thousand feet higher, within the range." (This is probably because the mild winds from the coast regions can strike higher places that are open toward the west, but can not get down into the northeastern valley.)

The Peace River District.

An elderly travelling missionary, who spent a considerable part of his life in Alberta, recently publicly pointed out the fact, that Peace River breaks up earlier in the spring than Bow River, at Calgary, about three hundred and fifty miles to the south. That is because the mountains west of the Peace River district are only about half as high as the mountains west of Calgary, and consequently the winds from the Pacific have more access to the Peace River district and make the climate there milder for the latitude than farther south. If the mountains west of the Peace River country were as lofty as those west of Southern Alberta, sub-arctic winters and cold summers would most likely make the Peace River district unfit for grain farming. We surely have good reasons to be thankful that the northern Rockies are lower than those farther south, at the same time as we should like to have them all lower, if we really look into the situation.

Northwestern Europe and Northwestern Canada.

The average person who is born or raised on the North American continent cannot be expected to take a very deep interest in European conditions unless there is something vitally concerning him, or he has been abroad for a trip some time. The same holds good with at least quite a few people in Europe. Those who have it good enough where they are and are not bent on emigration or travel, take everything that you tell them concerning Canada or America with "a pinch of salt" especially if you are inclined to boasting and soon their interest returns to their own surroundings, conditions and activities. Rightly so. "Mind your own business" is a good old rule.

But when it comes to climatology you cannot arrive at a clear conception of what your own home climate really means, unless you have compared it to the climatic conditions elsewhere on Earth. Most of the adult people here in Canada have moved around more or less during some period or other of their lives, so that few of us should be entirely ignorant as to the meaning of the word "climate". But when it comes to a scientific and at the same time practical comparison in a wider sense, the average person cannot be expected to have devoted himself to such matters.

A brief comparison with the climatic conditions in the parts of Europe on the same latitudes as our western provinces as well as our present Northwest Territories, together with consequences

as to national economy and favorable or unfavorable conditions for human settlement, may be further enlightening as to the unfortunate part the Eskimos are playing toward the vast part of Canada east of them.

By the way, regarding the Northwest Territories, I like to say the following, in which ambitious Canadians all over the country will likely agree with me:

The Northwest Territories are too large a part of Canada to remain undeveloped forever, or even to be a mere grazing area for reindeer, musk oxen, caribou and buffalo, with some lumbering, mining and fishing at favorable places. Without a certain amount of agriculture there will not be a harmonious, sound or steady character of civilization.

Grain and vegetables can be raised in the Mackenzie valley. But when there is a risk of damage from frosts farther south, nothing better can be expected that far north. Certainly in the middle of the summer the hours of sunshine are longer, but it draws quicker to the fall, and the winter season is too long. There are only comparatively few people who would like the winters of the Northwest Territories, which is plainly emphasized by the fact that this large region is nearly uninhabited, in spite of there being great natural resources and ample room for people to become owners of real estate. Among other things I like to point out in the following, is, that in Europe, or more precisely the greater part of the Scandinavian countries as well as Finland, there are millions of people living as far north as our Canadian Northwest Territories under good civilized conditions, even including considerable agriculture. In fact, it just needs a little improvement of the climate of the Northwest Territories to make them far more attractive, and I think such improvement is not impossible.

Of course, everybody is expected to know that on a certain latitude there is the same amount of sunshine, or solar heat, at least radiating to Earth above the clouds, but that topographical and atmospheric conditions are so different on different longitudes, that all places on the same latitude, that is, being located just as far north (or south), do not get nearly the same benefit of the solar heat. To analyze these conditions belongs to Climatology. To try to produce changes in climatic conditions for the benefit of mankind, so as to make certain districts on Earth more pleasant for human habitation, may be termed Climaturgery, to which one of the last chapters of this booklet is devoted, beside what will, before that, be said as to Canada's special problem.

Continental Europe.

The city of Paris, the capital of France, is located closely south of the 49th parallel. From the viewpoint of a Canadian, this is the same latitude as just across our southern boundary line from Emer-

son or North Portal, or exactly the same latitude as Fort William and Port Arthur, Ont. Any city above the million mark has a considerable slum population. So has Paris. In Paris many of these unfortunate people have no home whatever, but spend their nightly sleeping hours under bridges or in parks practically the year around, only being taken into police quarters or some other public institution during some exceptionally severe winter weather, to get warmed up, at the same time getting something warm to drink and eat.

Now, imagine people being able to sleep outside nearly the year around in Port Arthur or Fort William, or in the vicinity of Emerson or North Portal!

So much for France. Let us proceed to Germany.

Germany is on the same latitudes as the settled parts of our Canadian prairie provinces. Still, in great parts of Germany there may be no snow or cold in the beginning of January. People can be seen engaged in some kind of work on the fields any month of the year. In the Rhine valley grapes and other delicious fruits of various kinds are raised, such as we would not try to raise around Winnipeg on the same latitude. (In order not to create a false impression herewith, as if the Rhine valley were some kind of a paradise, it may be stated that our living conditions in Canada are ever so much better than those in Germany, overcrowded as it is and with high taxes on almost everything except the outside air. A good climate, of course, is far from being everything that is needed to promote human happiness.)

On the rivers in Central Europe shipping is going on, when our Canadian rivers are frozen. But during February 1929 Lake Constance, in the corner of Switzerland, Germany and Austria was frozen over, which happens only once in about fifty years, according to statements of people who lived around there. Shortly after it was frozen over, however, it broke up so suddenly, that three men and five children, who were out on the ice, drifted off on the lake, as the ice broke up, and had to stay out a day and a night before they eventually were noticed and saved by some fishermen, when the ice was nearly gone under the drifting party and some of them were stiff from the exposure to water and cold, for which they were not prepared. This lake is between the 47th and the 48th parallel.

Such an extremely cold spell as prevailed in Europe during January and February 1929 had not been experienced there for generations. The accompanying distress was so great, because the people did not expect and were not prepared for such an eventuality.

Buda-Pest, the capital of Hungary, on a latitude a little north of Fargo and south of Grand Forks, N. Dakota, normally has hardly three months of winter.

The Scandinavian Countries.

The writer of these lines spent his first eighteen years on the 59th parallel, in the heart of Sweden, between the largest lakes of that country, and the nineteenth year in the city of Stockholm, and therefore knows that part of the world by personal experience. This is fully as far north as Fort Churchill or Lake Athabasca in Canada. On that latitude in Sweden there grows an abundance of fruit of many different varieties, such as apples, pears, cherries, plums, gooseberries, black and red currants, wild and planted strawberries, raspberries, blueberries, lingonberries and others. Bare ground and mild weather prevails many a year in December and sometimes also in the earlier part of January. During the earlier months of the year the snow sometimes falls very deep, and occasionally the thermometer drops below thirty degrees. But long spells of thaw may take place any time during the winter. In general the climate is agreeable and the winters not very cold between the 55th and the 60th parallel in Sweden.

In 1911, after many years of absence, I visited the land of my birth and enjoyed the customary Swedish afternoon coffee together with old friends — out on the veranda in the month of October, in balmy weather, on the same latitude as Fort Churchill or Athabasca lake. Truly, it snowed during the latter part of the same October, but when I left in the beginning of November, the snow was nearly all gone again.

What would you think of having such a climate around the northern limits of our western provinces here in Canada? I hope that some day we will be nearer to it than we are just now!

Even in latitudes corresponding to those of our Northwest Territories — as far north as Hudson Strait, Chesterfield Inlet, Great Slave Lake, even as far as up to Great Bear Lake - there live in Finland, Sweden and Norway not less than six millions of people, on a high degree of culture and civilization. True, thousands of them emigrated from there, but they did not do that on account of the climate, at least I cannot remember hearing anybody say so, although, of course, when you get that far north there are different agricultural products that cannot be raised, which can be raised a little farther south. Still, if the land north of the 60th parallel in these countries were shut off from communication with the rest of the world, the people there would not need to be so badly off yet, having to be self-supporting, as rye, barley, oats, berries, meat, fruit, wool, hides and leather, excellent flax, lumber, cordwood, metals and other necessities of life are produced there in sufficient variation to allow the population to make a fair living and even enjoy many comforts, when the resources are properly taken care of, which they generally are. (As regards taking care of the forests the system there is second to no other in the world.)

According to the measurements of the Swedish militia, the average size of the Swedes in Norrland, that is the part of the country north of the 60th or 61st parallel, is greater than that in the rest of the country, and also greater than anywhere else in Europe, except in Norway. This tends to prove that the climate is favorable in those rather high latitudes. Finland, with a population of about 3½ millions, is almost entirely between the 60th and the 70th parallels, and the Finlanders are not inferior to any nationality when it comes to physical endurance. The climate of southern and western Finland is characterized by comparatively mild winters, milder even than the northern half of Sweden, which latter in a measure is in exactly a similar situation as our Canadian Prairie Provinces, although on a much smaller scale, having a mountain range to the west shutting it off from a narrow coast country and the beneficial winds from the ocean. The Kiolen mountain range between northern Sweden and the Norwegian coast country is, however, hardly half as high as the Rockies and consequently northern Sweden, as said before, has still a rather good climate for its latitude.

It may be a hard matter to interest some of our readers in these comparisons with such distant countries. But why should our Canadian Northwest Territories, being more than three times as large north of the 60th parallel as those three Scandinavian countries put together, have to be like unto a desert, nearly unpopulated (as compared to 6 million people in those countries)?

The Waters of the Atlantic and of the Pacific.

The influence of the Gulf Stream, carrying warm water from around the West Indies across the Atlantic ocean toward western Europe has been much emphasized, and it surely is something great for Europeans to be thankful for, especially when it comes to the northwestern parts of Europe. Iceland and even Spitsbergen included. The city of Reykjavik, Iceland, fully as far north as the northernmost bay of Hudson Strait, has a mean winter temperature of 32 above zero, and during January 1902 it was the third warmest capital of Europe (Athens and Rome being warmer). I have heard it stated that a certain pond in Reykjavik seldom freezes solid enough to make it safe for skating. (The average summer temperature, however, is only 48 degrees, and other parts of Iceland, of higher altitude, or further from the coast, are much colder.) — Norway is probably more benefited by the Gulf stream than any other country, having a lovely climate for being so far north.

Does not Canada enjoy an advantage just as great, as Europe has in the Gulf stream? Canada certainly does. Here we have the Japanese current, and, as stated before, the waters of the Pacific are twenty degrees warmer than those of the Atlantic. The coast of British Columbia surely receives enough warmth from the water,

when swimming can be enjoyed annually on Christmas day in English Bay, at Vancouver, even if the partakers "were just twenty or more", as they were reported to have been on Christmas Day 1923. Having a warmer sea to the west, Canada ought to have been warmer than Europe, had the topographical conditions been somewhat similar, especially without any high mountain range in the West.

Another favorable comparison between the Pacific coast of Canada and the western coast of Europe may be furnished from the following newspaper clipping (of 1923.

"Bulb growing in British Columbia has attained such success that bulbs produced in that province are finding a market in all parts of Canada and the United States. Shipments have also been made to England. One grower, who has studied the situation in Europe, recently declared "We can grow every bulb here in B. C. that can be produced in Holland (famous for its bulbs), there is not a bulb grown in Holland that we cannot grow here quite as well, and any number better than they can. By selecting our soils, we have better soils than they have — and we have a better climate. One Vancouver firm now ships thousands of hyacinth bulbs for Christmas blooming."

Of course, all this is far from being quoted to enlighten the British Columbians themselves, who know infinitely more about it than we others far away from their province. Neither is it stated in order to display the climate of Holland and adjacent parts of Europe in an unfavorable light, which simply cannot be done, as the countries around the North Sea belong to the most densely populated parts of the world, which proves that the climate there is comfortable for human habitation.

I just want to emphasize, that Europe is not ahead of, but behind Canada so far as a warm ocean to the West is concerned. The advantage of Europe is not there. If Europe had a rather straight and even coast line with a high range, or combination of ranges of tall mountains, all the way from 7,000 to 13,000 feet in height at a short distance from the coast, it would not have about 300 millions of people north of the 49th parallel, even though it had been inhabited up in the thousands of years. The inland of the continent, to the east of such mountains, would have had bitterly cold winters, in spite of the Gulf Stream, and humanity would have crowded itself and its habitations elsewhere.

The Effect of Mountain Ranges on Northern Asia.

In order to arrive at a still more complete understanding of the effects of mountain ranges on climate, after having compared Canada with Europe, let us go to a third great region, vaster than any of the two others, but also more unfortunate. In respect to climate Canada may perhaps be described as in a medium condition between

Europe and Northern Asia. Siberia is a country great in resources, but also known for having colder winters than any other inhabited part of the Globe's surface, except possibly Tibet.

Why are the Siberian winters so cold?

Surely Siberia is a northern country, but Europe has far milder winters on the same latitudes. Even Canada is decidedly milder. As Canadians we have great reasons to be thankful that our country is open toward the South, so that of the two prevailing winds, the west and the south, at least the latter is greatly beneficial in bringing us warmth, comfort and good working weather during the otherwise colder season.

Siberia, again, seems to be badly and thoroughly shut off from the benefits of a good south wind by a series of many east and west running mountain ranges in the countries to the south of Siberia as well as at the borders of and within Siberia itself. Among the ranges far to the south are the Himalayas, the highest mountains of the world, and the vast and intensely cold highland of Tibet is immediately to the north of the Himalayas. At the western limits of Siberia the Ural mountains, although less than half as high as the Rockies, still are long and continuous enough to weaken the would-be beneficial influence of moderating winds from the west (from the direction of the Atlantic) and to turn the isotherms of Siberia farther toward the south than they are west of the Urals, at the same time making the flora and fauna there more arctic or sub-arctic (depending where you are). During the short summers in Siberia there certainly are very hot temperatures, but this depends on the direct sun heat and the length of the days and is a general characteristic of northern inland regions with severe winters.

Mongolia immediately to the south of Siberia, on latitudes corresponding to those from St. Louis, Mo., to Saskatoon, Sask., also has hot summers. In winter the mercury descends to 50 below zero, and the snow sometimes falls so deep that the inhabitants have to dig themselves out of their huts. What mitigative climatic influence one might expect from the Pacific to the east (even though influence from the east generally is less than from other directions) is shut off by the Khingan and other mountains.

Observations and Theories on the Planet Mars.

Some parts of Earth are so intensely hot that it is very difficult, at least for the white race, to endure the heat. Other regions are so bitterly cold as to make them remain deserts of ice and snow, some altogether, others during the greater part of the year. It seems that if the Earth were more level or even, without high mountains or deep valleys, the winds should be distributing the heat more evenly, without abrupt differences, over Earth's surface. Whether hurricanes

and tornadoes then would be more frequent than now, or less, is a second question, with arguments for both sides.

The planet Mars, which has been studied by many with great interest, seems to have such ideal surface conditions as those just alluded to. With its lighter atmosphere and absence of intense heat, storms probably cannot become near as powerful as those on our Earth. The elevations on the planet Mars seem to be insignificant, which may partly account for the fact that the planet seems to get what heat it receives from the sun more evenly distributed and seems to get more proportional benefit from it than our Earth gets from its more than double the amount of heat on the surface unit (as Mars is a little more than one and a half times as far distant from the Sun as the Earth is and the heat received is in inverted proportion to the square of the distances). It is well known that the snow cap around each pole of Mars diminishes to a rather small area when it comes toward midsummer on the hemisphere to which each pole belongs. This tends to prove that the disadvantage in distance from the Sun (as compared with our Earth) must be more or less compensated for, through some advantage over the conditions of our Earth.

The circumference of Mars being only slightly over half of that of Earth, and the surface area of Mars consequently being only a little over one fourth of that of Earth, is another cause for a more even distribution of heat on the smaller planet.

The triangular net of straight lines on Mars, perhaps canals filled with water, indicates the possibility of intelligent beings inhabiting the planet. If the planet had been inhabited during past ages by a race now extinct (on account of the temperature turning colder, or from other causes), the canals, left without care, would have caved in and become more and more irregular in appearance. This does not seem to be the case. Whatever those lines are, they are apparently too straight, too many and too regular to be mere freaks of nature. That they are large canals, made for the purpose of irrigating the land between the two polar seas, is the most credible theory. We will briefly come back to them in a subsequent chapter.

Some astronomers think Mars is too cold to be inhabited. In the future more powerful telescopes than we have now, may help to settle that question. However, when the extent of the ice caps around the poles is smaller at its maximum, even in proportion to the total size of the planet, on Mars than on Earth, the latter being located on a distance only about two-thirds as far from the Sun, there must be substantial reasons for it. One such reason may be that there is less moisture, less material for snow. A contributing cause may be, that the more level or smoother surface of Mars, together with the smaller area, may allow the wind to distribute the heat more evenly than is the case on our Earth.

PART II.

THE WAY TO IMPROVE THE CLIMATE OF CANADA.

Operations on the Rockies.

Having now considered the influence of wind with or without wind-breaks near and far, let us turn back to our own Canada, to look at the problem that may confront us here, in order to arrive at a practical solution of really improving the climate here.

After a thoughtful perusal of the foregoing chapters, even the skeptics should be able to see, that the mountains of the far West, particularly the Rockies and the Selkirks, with the Coast Range in a third and much lesser degree, constitute Canada's greatest climatical obstacle.

In passing, a few words may be said about the Coast Range. Here we find the highest peak of British Columbia, and the highest peak of Canada outside of the Yukon, namely Mystery Mountain or Mount Waddington, 150 miles north of Vancouver, 13,260 feet. Other high mountains and extensive glaciers, very difficult of access, are also found around there. But as the stretch from north to south, where the mountains of the Coast Range reach great heights, is rather short, this range is of much lesser importance as an obstacle to the west winds from the ocean than the ranges farther east. The warm winds from the Pacific cross the Coast Range, even where it is as high as 7000 feet, and still retain some heat and moisture, as they continue through the interior highlands toward the Selkirks. Thus the western slopes of the Selkirks have a great rainfall and an abundant vegetation. But these conditions are not carried across to the still higher Rockies, which are much drier and on which the limit of perpetual snow and ice is between two and three thousand feet higher

In the southern part of British Columbia the Selkirks together with the high group of the Coast Mountains on the west and the Rockies on the east form a triple combination, a very formidable one, as snowfields and glaciers here run up in the hundreds, in all perhaps above the thousand mark. Most of them are only small, but there are a few snow and ice fields reaching fifty or hundred square miles in area. From Yellowhead Pass, or Mount Robson,

north to northwestward, the high Mountains, i. e. the Rockies, are only running as a single range, and beyond Mount Robson they are only about half as high as farther south. In other words, of the stretch between the U. S. boundary and the Yukon Territory, the northern 600 miles are not near as bad as the southern 300 miles. It is therefore evident, that whatever operations should be done, they would be easier and more paying from Mount Robson northward, in other words, beginning at the same latitude as Camrose or Edmonton. As the wind often blows from westnorthwest, the effects of operations farther north would be more sure to benefit altogether Canadian territory, and such territory that would need it more than farther south. At the same time, if northern territory were swept by milder winds, this also ought to produce a mildering effect farther south, particularly a few hundred miles east of the mountains, as the wind also shifts a little, in the shape of a nearly folded fan.

"What would you really suggest to have done in it?" is the natural question.

To make the climate of the country east of the Rockies milder, a sufficient number of snow and ice clad mountain tops must be blasted down, levelled off, so as to let through more of the mild air currents from the Pacific and British Columbia without having these air currents iced and chilled and partly stopped by these icy and snowy obstacles.

How much cutting will have to be done?

The ideal way will be to level off the mountain tops even with the perpetual snow line, or, more particularly, so many feet below this line, that the snow of the winter on the new level will be melted during the summer. Then it will take much longer in the fall before the west wind will get that penetrating chill that is so familiar to us, and damaging night frosts will come at a so much later date that the farmer and the gardener will have time to get their crops harvested and brought into shelter before there is a chance for the frost to spoil these crops more or less. It will also mean that plowing and other fall work on the farm as well as building operations and other outside work in city and country can be carried on later in the season and less handicapped than hitherto.

Winter will start later and be less severe. When the ground will be snowcovered the difference in temperature may not be quite so great as during the fall and spring, as the snow always binds a considerable amount of heat, or, in other words, makes the air colder. But the season of snow will be shorter and the spring time earlier, although the difference in the fall must be greater than in the spring.

Before any other work can be started, the regions of perpetual snow will have to be surveyed (where this is not done already) and complete maps made out, showing the extent of the snow-clad summits, their height and other particulars in regard to the work contemplated. The highest ridge of the mountain system is naturally

the most important, as the maximum height of the mountains separating the inland climate region from the coast climate region should be reduced, as far as possible, even below the vicinity of the snow line, so far, that no hindrance will be in the road for a clean sweep by the milder air currents from west to east.

As said before, the ideal way will be to level off the mountain tops a little below the perpetual snow line. In some cases this may only amount to a couple of hundred feet in height, but in other cases up to two or three thousand feet, or even more, as in the case of Mount Robson, where on account of the awful bulk such operations may seem absolutely prohibitive. It would be unfortunate, however, if nothing could be done to Mount Robson, as in a case like that the difference between before and after would also be so much greater, if the height could be reduced. Perhaps about 1500 feet may be the maximum height that could be cut down, in the case of high and narrow peaks, but it may also be far from it in one direction or the other. Professional estimates will have to decide what can be done and what is out of question.

In the southeastern part of the Canadian Rockies the atmosphere is dry and the snow line comes as high as about 9,000 feet. In the Selkirks it is from 7,500 down to 6,000 feet. West of the Peace River district and toward Yukon it gets lower the farther north you come.

Whatever the mountain looks like and whatever method is used to reduce it, a start at the bottom of the part to be cut off should for all reasons be the most practical. Therefore peaks hard to climb need not necessarily be more difficult to reduce than others.

Most likely common mining or quarry methods will have to be used. This will be a new line or branch of such work, and if present methods are too slow, costly, or inadequate, the methods have to be improved until they are effective enough. Twenty years ago nobody would have been able to draw pictures of the air crafts that have crossed the Atlantic as well as the Pacific during the last two or three years. Maybe we can go ahead with the ruination of those castles of Jack Frost as soon as a sufficient number of qualified scientists have ascertained the usefulness of this project to the governing authorities, the legislative assemblies and the public in general. But it may take some years, until fast enough methods have been devised and tried. This will be for mining and quarry experts to determine, whether present-day methods are good enough, or if it be necessary to wait until faster and cheaper methods will be developed, which probably will not take long, if it is found really important.

Through the perusal of professional publications I have gathered certain ideas of what can be done. And a few gleanings may here be given for the benefit of those who may know still less about such

activities than I do, or for those who may like to compare these notes with their own knowledge.

In "Stones and Quarries" by J. Allen Howe, O.B.E., B.Sc., we find among other interesting things the following, which will give us some idea of the extent, etc., of quarry work done elsewhere:

"In 1913 from the quarries of Great Britain were taken of limestone alone 12,748,864 tons, of other rock approximately 25,000,000 tons." (Of course, mining, underground work, as distinguished from quarrying, is not included in these figures and will be considered afterwards.)

"In Great Britain there are about 10,000 open quarries and many smaller ones besides. In France there are about 40,000 quarries, some being underground. The number of persons employed in Great Britain in and about quarries is 80,000, more or less, and the weight of explosives used annually is over 6,000,000 pounds, whereof something like 80 per cent is gunpowder."

"In some quarries the plan is to employ very large blasts at long intervals. For this purpose a gallery is cut back from the face of the quarry, and at the desired distance from the face cross galleries are run right and left parallel with the face to be used as chambers for the explosives, or the chambers may be made in other ways, as circumstances dictate. The chambers are then carefully filled with gunpowder charges of 5 to 10 tons or more being employed, electric or safety fuses are laid, the powder is protected from damp, and then the remaining portion of the galleries is filled out with turf and earth near the explosive, and further away with removed masonry. When the explosion takes place, there is not nearly so much noise and disturbance as might be expected, the action seems to be rather slow, but the results are striking. tens of thousands of tons of stone are shattered. With a blast of this kind at the Elfi quarries 10 tons of black powder distributed between two chambers brought down stone estimated at 200,000 tons."

"Another way of breaking a large mass of stone is by firing at the same time the charges in a large number of shotholes, distributed over the quarry face so as to obtain the maximum effect. For this purpose a "simultaneous fuse" is used, which links up the holes with a single electric shot-firer."

"Compressed Air. An extremely interesting method of quarrying granite has been employed at Mount Airy, North Carolina, where, taking advantage of a sloping hillside and the sheeted structure of the rock very large areas of stone are lifted by compressed air. A small hole is drilled to the depth of 6 ft. in the centre of the area to be lifted, the bottom of the hole is enlarged by springing shots, and horizontal cracks are started by the explosion of repeated charges of small powder, until they have spread from the holes for about 100 ft. An air compressor, producing about 100 lbs. pressure, is then

connected to the hole by a pipe, and air is gradually forced in. Sheets of granite several acres in extent may thus be cheaply raised."

"Undercutting. In some Silesian quarries great quantities of stone are brought down by undercutting the face and temporarily supporting the underlying mass with props, which are later removed suddenly by an explosion."

If a suitable method of undercutting could be brought into use, so as to make large blocks of mountain mass either topple over or else come on a slanting plane in the form of a landslide down into a precipice below such a method ought to be far less expensive than cutting up a mountain into small pieces.

A cone or pyramid shaped mountain, of great height in proportion to the base should be a most paying object, having a maximum of snow surface in proportion to the rock to be brought down. On the other hand, a flat or otherwise wide snowfield or glacier would be a most hopeless proposition, unless by flattening out the surrounding mountains wider winds may gain access to such a region, thereby bringing the snow and ice to melting partly or all over.

On December 6th, 1917, there was demonstrated in an awful way how much an explosion can do, when the entire city of Halifax, N. S., was devastated, whereby 1,800 people were almost instantly killed, 2,000 injured and maimed and 25,000 rendered homeless. Think of, what good effect such a powerful explosion should have had on a snow dome in the Rockies, if properly directed and with human beings out of danger!

A very different and more cheering example we may also take from Nova Scotia, from Old Bridgeport, Cape Breton, where there is a coal mine running not less than three miles under the sea, with an underground garden a mile below the surface. Three miles is also just about the height of the tallest mountains on the North American continent, the narrow group at the southwest corner of Yukon, on both sides of the boundary between that territory and Alaska in the immediate vicinity of the Pacific ocean. This example from Old Bridgeport N. S., would tend to make us believe that there should be no mountain on this continent that could not be flattened out, provided that they consist of nothing harder than coal.

Although the work here suggested should be more akin to quarrying than to mining it is also likely that mining methods could be partly used.

In comparison with deep mining, the work of cutting down a mountain top seems to have great advantages.

The cutting of mountain tops so as to make them, say, 6,000 feet lower would not even be of much use, unless the country both east and west of the mountain in question would be 6,000 feet lower, or the surrounding mountains would be flattened out to that level, in which case it naturally would be of a great advantage to allowing a clean sweep to a that much lower and therefore at the same time

so much warmer west wind, going to benefit the eastward country. This should at least be the case, if the gigantic Mount Robson could be cut off at its waist line. Here the dam or wall between the climates of British Columbia and Alberta appears to be just equal to that great mountain, the line is very narrow, counted in miles. A number of years ago this mountain was visited by A. P. Coleman, Ph. D., F.R.S., Professor of Geology at the university of Toronto, and in his great work, "The Canadian Rockies", he states the following:

"With plenty of moisture and the mild Pacific climate, the bottom of the Grand Forks valley (just west of Mt. Robson) shows a magnificent forest growth. — — —

"This valley is about 3000 ft. above the sea, and the warm, moist winds from the ocean have free access between the rather scattered and low mountains of the Gold and Coast ranges, bringing with them the mild, wet climate of the coast, though Grand Forks is three hundred miles from the nearest arm of the Pacific. — —

"Only a few miles away, but 2,700 ft. higher and at the rear of the mountain (Mt. Robson) the climate and vegetation are totally different, no hint of luxuriance. — — The whole assemblage is that of a cool, somewhat dry region, a strong contrast to the rich and prosperous growths on the southwest side of the mountains."

This shows plainly different valuable facts. One of them is, that an altitude of 3,000 ft. still benefits from the mild Pacific winds. It is only the tallest mountains that prevent the mild ocean breezes from continuing their pleasant and powerfully growth producing influence over the more level provinces farther east.

The winds from the world's greatest ocean, if given their opportunity surely ought to benefit the climate of Canada as far eastward as the winds from the Atlantic do in Europe, that is, even to southern Russia, which will be about the same as to Hudson Bay and to Winnipeg here in Canada.

Some years ago in a certain house in Winnipeg on Ellen Street a friend of mine, who rented a room upstairs above the entrance hall did not seem to be able to get any heat in his room during the winter, even though there was a good fire in the furnace and the rest of the house was warm. One evening however he came upon the idea of examining the upper end of the register leading from the furnace up to his room. He found that register plugged up with different rubbish which all the time before had prevented the heat from coming up. After he had removed that rubbish, his room became warm and comfortable.

This is a story almost too simple to be put in print, and similarly it may have happened elsewhere, to the knowledge of some of the readers of these lines. But this is precisely the same situation in which the greater part of Western Canada is. The Pacific ocean, 20 degrees F. warmer than the Atlantic, is our tremendous furnace,

but there is interfering rubbish in the form of icy, perpetually snow capped, high mountain summits, that must be removed, before we can receive the benefit of the warmth that should be naturally flowing in over our country from the greatest of all sources.

In order to prevent a possible misunderstanding let me point out, that there is nothing so unreasonable proposed here as to take away the Rockies as a whole or even any appreciable fraction of their almost incomprehensibly vast bulk. If such a thing could be done, no doubt it would give us a wonderful balmy climate all the way from the shores of Vancouver Island eastward perhaps toward Kansas, or much further. However such utopian projects that could not be realized during all the rest of the century with all the capital of the world behind us, are not proposed herewith. The parts of the Rockies above the line of perpetual snow are those which are particularly causing the summer frosts the early autumns as well, and if they are cut off milder winds will make the winters on the prairies more tolerable and the springs somewhat earlier. These parts of the mountains, although scattered over a great stretch of territory, are so insignificant in bulk as compared to the mountain system as a whole, that the task of conquering them is not hopeless. We cannot expect, here on the prairies, ever to get a climate like that of Vancouver or of Victoria B. C. where flowers bloom outside the year around. But to make the cold weather in the autumn or the early winter come a month or two later, make the minimum temperature of the winter 10 to 15 degrees F. higher and the spring a month earlier I think should be a goal not impossible to attain, even if it could not be accomplished in a short time. I am inclined to think the benefit would be greater in the latter half of the calendar year, that is, in the fall and early winter months, as the west winds then, instead of now treating us with the chills from the ice and snow on the tops of the Rockies, would be free from that chilling element, and besides be so much warmer as their lowest atmospheric stratum in crossing the mountains would be warmer than the original lowest stratum. The latter point would be the one chiefly of account in the middle of the winter after the snow lies and the ground generally more covered with snow. Therefore, the difference might not be so great in mid-winter and spring as in the fall still there should be an appreciable difference. In Europe on the latitudes of the southern halves of our western provinces seeding is generally done in March. Whether such a climatic result could be attained here through the operations suggested, it may not be wise to predict. But somewhat earlier the spring should come than heretofore the winter frost should not have a chance to get down so deep and should leave the ground somewhat earlier. After the snow is once melted in the spring all over the country the only cold spells should be coming from the North. They are not long nor frequent and should be a few degrees milder than they are now.

The question of transportation of explosives and other material and equipment may in some cases be a real difficult one to solve, for instance where the mountain or the snowline is very high or difficult of access, or far from railroad or water traffic, which latter is more the case in the far north than in the south. This, together with the needs of settlements in those directions, should lead to the building of new railway lines. In the immediate vicinity of the mountains trails or toat roads may have to be cut, sometimes perhaps running in the way of a spiral around the base of the mountain. In some districts the transportation may have to be done while the snow is on the ground and swamps, lakes and rivers are frozen. Air craft may possibly have to be used for reaching some places. However, if the main work, of cutting down the mountain tops, is found feasible, transportation obstacles will not prevent the project from being carried out.

Comparisons with other great Engineering Works.

The government of China was said last year to be contemplating to tear down the "Chinese wall", for the sake of using the immense masses of building material it contains. At the present time we cannot vouch for the truth of this statement, and even if the intention is serious, it is hard to say when the civil wars will be over, beside that hundreds of other more directly important matters may have to be attended to first. As this wall yet stands, it is the largest building work on Earth, of all times and of any nation. It was built about two thousand years ago by the Chinese emperor Huang-Ti, as a protection against the northerly neighbors of China. It is 1500 miles long, 25 ft wide at the base and 15 ft. at the top, height from 15 to 30 ft. As the stone is mixed with earth and grass grows on top, the mass of stone in the wall is variously estimated, at from 900,000,000 to 3,000,000,000 cubic feet. It was built in the short time of fifteen years, but already then China must have had a large population. In our days a similar enterprise would cost perhaps between two and three billion dollars. But in the days of emperor Huang-Ti the laborers were probably lucky if they got their mere board, in other words, it must have been real slavery.

Other great building works of ancient times are the pyramids of Egypt. The Cheops pyramid, one of "the seven wonders of the world", contains 75,000,000 cubic feet of stone. According to Herodot (the "father of history") it took 100,000 people 30 years to build the pyramid of Gizeh. But in those days machinery was very primitive.

If our astronomical observations are not too deceptive, it appears as though the "canals" on the planet Mars were made by intelligent beings (as already said before), as it is hardly likely they would be so straight nor in such beautifully laid out triangles, if they were mere freaks of nature. No building works on Earth are so

large as that. Our railroads have a greater length, truly, but instead are exceedingly thin, as compared to those canals. (Although it is outside of the subject of this book, a majority of the readers may have queer feelings when they think of the possibility of Mars being inhabited. As my private opinion, I may perhaps be allowed to say, that I consider the Creator capable of having put inhabitants on Mars, if He so has chosen.)

We are living on another star in the heavens, and this star has been changed so much on its surface, even by human hands, during the last few thousands of years, and especially during the last one hundred years, that you will find it wonderful, when you stop to consider it. If you could imagine an observer on the Moon, especially if provided with a good telescope he should certainly have been able to note great changes on Earth's surface during these last hundred years, construction of great lines and nets of railways, the growth of large cities, devastation of forests through fires and by the ax and saw. (Would planting of forests have been noticeable?)

The building of a tunnel under the English channel, between Dover in England and Sangatte in France, is to be started immediately (March 1930). It is expected to give work to 24,000 of England's great number of unemployed. The tunnel will be about 38 miles long, whereof 33 miles below the water surface (about 300 ft.). It will really be two parallel tunnels or tubes, each of 19 ft. width, running about 50 ft. apart and connected at different places, also having a safety tunnel for water and particles of solid material running from below the lowest point of the main tunnels to still lower points by shafts being sunk on the coasts. The total cost is figured at about $140,000,000 (rather low it seems). A great traffic is expected to pay from 8 to 10 per cent on the capital, as a trip from London to Paris should only take 5 to 5½ hours and the tunnel therefore should be much used by the public. The work of building the tunnel is expected to be finished in about eight years.

Just before this book is going into print latest news are to the effect, that the plan still has to be discussed in parliament and therefore is still subject to changes.

To blast down snow-clad mountain tops ought not to be a work of more difficult nature than to construct a tunnel under the Strait of Dover, everything considered.

The Beauty of the Rockies.

As to the beauty of the parts of the Rockies affected, there should be more gained than lost through these operations. There should be, say, about fifty times as many tourists interested in looking over these mountains afterwards as before the operations here suggested.

How could this Project be Financed?

There is hardly any doubt, that a sufficient number of men could be hired and enough of explosives, machinery, material and provisions could be obtained to carry this project to a successful conclusion in a reasonable working time, say perhaps from ten to twenty years, if there were no shortage of funds to back up the enterprise.

At present the national debt of Canada is over two billions. If this had not been the case, but such a sum could have been spent on the Rockies, a very perceptible result may have been accomplished. Without surveys and estimates by professionals, it is, of course, idle to try to say in real earnest how much money would be needed, as the layman may hold himself up to ridicule by coming too far from realities. For my humble part I have been wondering, if an average of a million dollars for each mountain top would be sufficient, or if it would come nearer to ten millions. As the snow and ice clad mountain tops run up in the hundreds or even in the thousands, may be a billion dollars, spent on the most favorable section, would make the frosty parts of the year more tolerable or even pleasant east of that section.

Surely there is a great difference between mountain and mountain, depending on how hard or loose the rock or the ground is, their shape, difficulty or lesser difficulty of access, etc. The old proverb "practice makes perfect" will probably hold good also in this case. Special methods may be figured out, and if the work is ready to be started, and after practicing on a few mountain tops the engineers and workmen may arrive at a definite procedure in order to get a maximum of result at a minimum of expense.

There are some countries in Europe, the war reparations or war preparations sums (as the case may be) of which would be amply sufficient to reduce the domination of Jack Frost in Canada, and each of those countries is smaller in area than one of our western provinces and probably no richer in natural resources. They have very much larger populations, but the consuming needs of those populations are also vastly greater. The huge sums for the said purposes are granted by a majority of the respective parliaments, and those purposes seem to be of a more or less compulsory nature, the pros and cons of which would not be the place to discuss here. But and this is our question — ought it really to be so much more difficult to obtain the necessary funds for a peaceful purpose that would be of a positive benefit in a territory as large as several of the European countries put together? (The rest of Canada also ought to get more or less indirectly benefited.)

If the problem were up to our southern neighbor and were of as urgent nature in Uncle Sam's domains as it is here, it would be comparatively easy for the United States to put up the necessary funds. But Canada is a century younger in point of being populated (the

fault chiefly being with the climate, fully as health-promoting, but having too much frost), and therefore the financial problem will to us present much greater difficulties. (By the way, the United States surely have their own Rockies, but that mountain region is very much wider than ours, and the states east of same receive more direct sun heat than do the prairies of Canada, therefore there is not a vital question of this character in the United States.)

Some parts of Montana, North Dakota and even Minnesota would almost surely receive a benefit from levelling down the icy summits of the southernmost Canadian Rockies. This section of the Rockies might be attacked at an early stage, if the United States would do their share financially, but otherwise it seems it should be left to the very last, as here are found the most extensive, high and hopeless looking fields of mountains, and, at the same time the benefit to Canada would hardly be as great, nor the country to the east quite as much in need of it, as if the work here suggested were started on the sections farther north.

An ideal way would be, if the enterprise could be made to pay for itself directly, or partly so, through minerals and ores being found in the mountains, or through oil wells and other natural resources in the territories benefited. However, such industries have their own disbursements. Whether any contributions to defray the costs may be had in such a way, must be left to future discussion after due investigation.

After the Canadian public is once convinced that the climate of the country will be improved through these operations, the money will be supplied somehow. The saving of crops from frost, the saving of fuel and other protective means against the cold, and greater national wealth acquired by a larger population, feeling more at home, will in coming years indirectly pay the outlay.

General Working Plan.

The best way will probably be to level off the ice and snow clad mountain tops where the Rockies are narrow, for a stretch of, say, about one hundred miles, making an open wind passage from the Pacific to the prairies at the reduced top level obtained, and then to observe the effects on the country directly to the east of the lowered line during the following cold season. If the best hundred miles could be chosen and the work done rather thoroughly, such a stretch alone might produce a decidedly favorable change to a large strip of country east of it. After that closer calculations could be made as to the costs and plans for the work on further stretches.

Where the work should be started and how much of it should be done at a time would have to be decided by the public or by legislation, after the principle of improving the climate has once been found acceptable.

PART III.

THE GREAT NORTH.

Northern Canada.

The northern two-thirds of Canada are almost uninhabited. In that immense area are included the northern parts of all the larger provinces, as well as the Northwest Territories, the Yukon and the islands of the Arctic. Some parts of the great North are just as naturally rich as southern Canada in fertility of soil, mineral deposits, game, fish and other resources. But the climate is the great handicap. Very few people would like to take up their steady abode in those regions, as they are. Some thousands of people surely would be willing to stay almost anywhere for a few years, if the working of mineral deposits or something else would pay them such good returns, that afterwards they could retire to more congenial climes to live in independent circumstances.

But this is not the ideal of a Northern Canada as we should like to have it. I think, if the plan outlined in the preceding chapters of this booklet can be carried out, there are hopes that at least the western or southwestern parts of these great regions can be transformed into settled districts by and by, where people will be able to enjoy about as good comforts as at present are enjoyed in the southern parts of the prairie provinces.

Vilhjalmur Stefansson, the great explorer of the Canadian Northland (who spent thirteen summers and ten winters in the North and who has much of justified faith in that part of the country), writes in one of his many exceedingly interesting works as follows.

"The ice breaks at the western end of Athabasca Lake about the middle of May and out at its east end a week or two later, for the seasons seem a good deal colder as you go east."

Lake Athabasca is about 195 miles long

Why are the seasons so much colder as you go east? — Very naturally, because you get so much farther away from the warming influence of the Pacific. Very naturally, I say again!

Now, if the said warming influence of the Pacific could be extended farther eastward, the country also could be made inhabitable farther eastward, and our Canada would be that much greater.

Lake Athabasca is considerably nearer to Hudson Bay than to

the Pacific ocean. Still some influence of the Pacific evidently reaches this lake (partly in Alberta and partly in Saskatchewan and fully so far north as Churchill, Man., the Hudson Bay harbor). This naturally gives us the idea, that if the winds from the Pacific were given a greater chance, more free play, by the cutting down of perpetually snow and ice clad Rocky Mountain summits, that are partly stopping or damming, partly icing those winds, the result may be felt even to the Hudson Bay, to Churchill and at least the nearest part of the sea. This is so much more probable, as there are no obstacles in the form of high mountain ridges between Lake Athabasca and the Hudson Bay, and the prevailing winds are westerly. Churchill harbor with surrounding district surely ought to profit by a higher general temperature.

The length of the summer in Northern Canada is generally given as three months, but the summer days are long, with much sunshine, at least in favored parts of these great regions, and wheat and other agricultural and garden products ripen even in the Mackenzie River valley. Of course, the farther north you get, the earlier the fall frosts set in. The summer, however, although short, would be a delightful season, if the country were not so much pestered with mosquitoes and bull flies. To get rid of at least the most of these insects is also a problem worthy of solution, even if secondary to the climatic problem. The pouring out of oil on water pools, as has been successfully practised around Winnipeg, will probably be too costly to be used when it comes to large areas, but the draining of swamps and bringing the land under cultivation will do much to reduce the mosquito pest.

With the bull flies, which are very much complained of all over the great North, from Mackenzie River to James Bay, some other method must be invented to exterminate those insects, in connection with the cultivation of the land, as just mentioned. The habits of the bull flies will have to be studied and a method of destroying them invented accordingly.

In one of the large American cities, where I stayed for a couple of years as a young boy, the big street lamps were regularly beleaguered by swarms of different large insects during the hot summer evenings and nights. It looked as if you should have been able to collect from half a pound to a pound of them around a single lamp, that is, if you had found a way to catch them. If you could have applied a transparent blue or colorless, hot, open flame under the large, bright, attractive lamp, you should have been able to burn those insects and kill them off in that manner. Whether such a theory could, with suitable utensils, be carried into practice to exterminate the bull flies of the North, I am not prepared to say, as I have not tried it, and it depends also on the habits of the bull flies. I hope some economical method will be found for their extermination.

as, after that, life in summer time would be much more pleasant in Northern Canada.

The question of distributing the territories north of the 60th parallel from Hudson Bay to the Yukon boundary between the nearest provinces was brought up about a year ago. That a high official (same as with a common citizen) entertains high ambitions for his province, proves that he loves his province, and that is certainly to his personal credit. But to distribute those territories between the provinces in a way satisfactory to all concerned is, frankly spoken, impossible. It cannot very well be done without giving rise to jealousy, and it will spoil the harmony between the provinces.

Some day in the future probably the best way to dispose of the Northwest Territories will be to make them into a new province, as with the continual influx of settlers these will probably, before many years are gone, spread out even north of the Alberta and British Columbia boundaries. If the climate can be improved, according to the principles here laid down, the southwestern part of the present Northwest Territories should get a climate something like the Peace River district has now, and after the population exceeds the first 100,000, a new province can be created. The natural nucleus should probably be to the south and west of Great Slave Lake, with the capital at the lake or one of the larger rivers of that district.

The Extensiveness of Hudson Bay.

It may be interesting to many readers to have a comparison between Hudson Bay and the two probably most important inland seas of the world, the Mediterranean and the North Sea.

The Mediterranean is 2200 miles long, breadth from Venice to the Gulf of Sidra 1050 miles, area 1,100,000 square miles, average depth 4500 feet, greatest depth in West basin 12,230 feet, in Eastern basin, southwest of Greece, 14,695 feet.

The North Sea is 700 miles long, extreme breadth 420 miles, area approximately 190,000 square miles, depth in the South 90 to 150 feet, in the North 180 to 450 feet, greatest depth in Skagerrak 2652 feet.

The Hudson Bay is 1300 miles long, greatest width nearly 600 miles, area 443,750 square miles, depth 420 to 600 feet.

Hudson Strait is about 600 miles long, from 60 to 130 miles wide, water exceeds 600 to 900 feet in depth, tides of from 35 to 60 feet.

The Hudson Bay is in area equal to nearly one-eight of the land area of Canada (3,729,665 square miles), and more than one-eight, if you consider that in the said land area there is quite a little water surface included.

Greenland.

After regular traffic on the Hudson Bay route will be established between Churchill and European seaports, the ships will travel right past the southern point of Greenland, or not very far from there at any rate. Some arrangements for stopping there, regularly or in cases of necessity, will most likely be made. The name of Greenland will be far more familiar to Canadians in the future than it is now. A brief geographical and historical sketch of that solitary Northland may therefore be of interest.

The general rule all over the Earth that a coast facing west has a milder climate than a coast facing east, also holds good as regards Greenland. Along the eastern coast the sea is full of ice floes even during the best months of the year (June, July and August). Vegetation on that coast is extremely scanty. Although the climate of the western coast cannot be described as mild, still during the summer there are a great many varieties of plant life, including willow bushes, alder and cranberries, beside different wild flowers. Potatoes and garden vegetables can be raised. There are many birds, as well as other animals, and fishing goes on during the winter as the outer sea remains open, even when the temperatures are 30 to 40 below zero. Halibuts weighing up to three hundred pounds are sometimes caught.

The total area of Greenland is 827,275 square miles. The interior of the country, 715,409 square miles, is covered with the so-called inland ice, thousands of feet in height.

When you come from Hudson Bay and Hudson Strait out into the northwest arm of the Atlantic between Labrador and Greenland, you get into waters that have been navigated by European sea craft for between nine and ten centuries. Greenland is the first country on the Western hemisphere that is known with full certainty to have been settled by people of the white race. The first Norse settlements lasted between four and five hundred years.

In 982 Eric the Red came to Greenland and stayed there for three years, exploring the country. On his return to Iceland in 985 he called the land Greenland, in order to make people more willing to go there. There surely was green grass around the western fjords in summer time, so the name was not entirely out of place. In 986 Eric the Red started from Iceland with 25 ships, of which only 14 reached Greenland. There were only sailing ships in those days, of course. The ships were small and the equipment primitive, so the failure of so many of them is not to be wondered at. A colony was founded on the southwest coast, in the present Julianshaab district, not far northwest of the southern point, Cape Farewell, as that point now is called. This settlement was called Oesterbygd (pron. Usterbygd), or Eastern Settlement, and comprised about 190 farms. Later was founded the Westerbygd or Western Settlement, comprising

about 90 farms, where we now have Godthaab (pron. Gothhobe) the seat of the Greenland government. In Osterbygd there were 12 churches on Westerbygd 4. Numerous ruins in the two districts indicate where the colonies were located. Wooden coffins from these days, with skeletons wrapped up coarse hairy cloth, and both pagan and Christian tombstones have been found.

By and by the communication with Europe became less frequent, partly on account of the ravages of the Black Death in Norway (the city of Bergen having been the main port of support as well as in Europe in general). The last ship, that is known to have visited these colonies in Greenland, returned to Norway in 1410. After that the colonists became forgotten and being of themselves unable to produce some of the main necessities for life the inhabitants were doomed to a slow death probably putting up awful struggles before that. The last generations seem to have deteriorated very much in size. According to the sagas Eric the Red was nearly 7 feet tall but the last generations were only around 5 feet or something like that, and by undernutrition anyway, judging from remains in the graveyards. It is not probable that grain could have been raised in Greenland in these centuries, when it cannot be raised there now and other important necessities must also have run out. Likely the last survivors must have died about the same time as Columbus discovered the lands of the Western hemisphere much further south. As a mixed race the old Norse Greenlanders are probably yet surviving in the so-called White Eskimos in the northernmost parts of Canada.

After Leif Ericsson, son of Eric the Red, had discovered the American mainland in the year 1000 a few years later Thorfinn Karlsevne (said to have been a Swede) sailed with 3 ships and 160 men from Greenland to what is now Nova Scotia, but returned to Greenland three years later. As said before, navigation in these days was laboring under primitive conditions, and the difference between Greenland and the great continent to the Southwest was probably not clearly realized otherwise greater efforts would likely have been made to remove the colonists to climes more congenial for agricultural and general purposes. There may also have been difficulties with the aborigines of the American continent. Still something else may have contributed. Greenland may not seem to be a very cheerful country but it is said even in our days, that most people who ever lived there long to go back.

During the four and a half or five centuries of the mediaeval age, when Greenland was settled by people of the Norse race, the total population at a given time was variously estimated at from 2,000 to 10,000 souls, the lower figure probably coming nearer to the reality. That is, in all perhaps 50,000 people of the white race lived and died in Greenland during these centuries.

The present population are mostly Eskimos, 14,234 according to the census of 1921 with a small number of Danes (274 according to

the same census) as the ruling element, the country being a Danish crown colony since 1914, when Norway (to which country Greenland formerly was considered to belong) was separated from the dominions of the Danish crown. The Eskimos, after having received the Christian religion and civilisation, compare favorably with other races.

As pointed out before, on the Hudson Bay route the ships will travel right past Greenland, an inhabited country, a little more than half way on the road from Churchill to Liverpool, Glasgow, Belfast and other ports of Great Britain. This is an advantage which the southern routes between North America and Europe do not possess, and it will surely be of importance many times. Among other things, if land can be past within sight during the middle of a sea voyage, passengers will get a temporary relief from sea sickness (those who are troubled in that way) and at the same time a welcome variation from the regular more monotonous outlook on sea and sky.

As the Danish state has an annual deficit of about $150,000 (or something like that, naturally varying with different years) on the trade and administration of Greenland, it has lately been suggested that Canada ought to purchase the great island from the Danish crown, if the latter be willing, as Greenland would round off the Canadian territory and be of great use to Canada for purposes of navigation, aviation, etc. If such a transaction is thought to be agreeable to both parties, the matter should not be long delayed.

When you look at the map, you will see at once that Greenland would naturally fit in as a Canadian territory. Among other things some tourist traffic from Churchill to Greenland during the summer months will probably develop sooner or later.

A Theory on Ice Conditions in the Northeast.

There are always some people interested in exploring the far North. Often it seems as if the great mass of results were only of purely scientific, theoretical value. But you don't always know which of those scientific observations will be of great practical account sooner or later.

What we are especially interested in here, is the Hudson Bay route. Although going through waters that continue toward the extreme North, the route itself is not very far north. As has been said before, there are in northwestern Europe on the same latitudes millions of people living under highly civilized conditions. This gives us good reasons to hope, that it will be possible to improve the conditions along this route with the years, making for a higher degree of safety and a longer season by and by.

The greatest dangers to sea traffic in the northwest Atlantic are the icebergs. They also make the atmosphere colder, wherever they are.

Let me at least present a theory regarding icebergs and a possible way to deal with them, according to the old proverb "An ounce of prevention is worth a pound of cure." I hope that, sooner or later, it may be possible to convert this theory into practice. The idea would be as follows:

The glaciers of Greenland reach a known maximum height of 8,992 feet, even in the more southerly part of Greenland (according to the famous Norwegian explorer Nansen, who with a party including five others crossed this great island under extreme hardships in 1888). The inland ice may be still higher elsewhere than on Nansen's route. At any rate, Greenland alone has ice enough to fill the entire North Atlantic with icebergs and floating ice during all seasons, — if the ice could get out there! — Yes! Think it over! — Now ice would be formed to take the place of whatever would be melted out in the sea. Other polar regions would assist to the same detrimental purpose, and sea traffic in the North Atlantic would in such case be impossible, or nearly so!

Why does not this happen?

Evidently because the icebergs slip out in the sea (the glaciers "calve") only at scattered places here and there along the coast.

The logical conclusion here seems to be very clear. Whether, or how far it may be possible to carry it into practice, is perhaps too early to say without special explorations for the purpose. The icebergs break off from the glacier, which exerts a great pressure, and they tumble down into the sea with an awful noise and disturbance — where they can do so! Where they cannot slip down into the sea, they have to stay where they are. — How would it be to re-shape the coast line at those scattered points, so that no icebergs could slip out? The coast in its entirety would have to be examined and the different stretches and points compared, for the purpose of eventually bringing the bad places into conformity with the safe ones. — How would that be?

Along the eastern coast of Greenland there are continuous ice-floes, coming from different parts of the Arctic sea, some supposedly even from the North Siberian shores. They consist largely of flat ice cakes, mixed, of course, with icebergs and rough ice of all shapes. To get rid of all the floating ice in the northwestern part of the Atlantic during all seasons is a long way off indeed. But the less ice the better, and especially if the number of big icebergs could be reduced to a minimum, it would be a great advantage to shipping, first for safety's sake, secondly for speed, and in the third place also for temperature in and above those waters.

This is not only concerning the Hudson Bay route, as drift ice during its season gets as far even as to the southeast of New York. Happily enough, disasters like the one with the "Titanic" are seldom occurring nowadays, but there is always the necessity for a ship to watch out and slow up during the season of the icebergs, beside the

chill in the atmosphere and the presence of something that you would rather wish would not be there, even though it may offer a spectacular sight.

The limit of drift ice on the Hudson Bay route to Great Britain does not seem to run any farther east than on the routes from New York and Halifax, that is, on the voyage from Churchill to Liverpool you pass the limit of drift ice a short distance east of Cape Farewell, Greenland, almost all of the main Atlantic being free from ice. The greatest influence for the good against the ice in the North Atlantic is, beside the direct sun heat, certainly the Gulf Stream.

PART IV.

CLIMATURGERY AND KINDRED SUBJECTS.

Climaturgery.

There are still vast unsettled regions on the surface of Earth, in different latitudes, from the poles to the equator, where the climatic conditions are such, that few if any human beings can take up their steady abode there. The time will come, when there will have to be great migrations from overpopulated countries to such regions, because there may not be enough room elsewhere. But first the climatic conditions in those unoccupied regions will have to be made more tolerable, wherever this can be done. (With the interior of Greenland, for instance, as well as with the Antarctic mainland, you hardly take any chances in saying, that they will forever be uninhabitable, except temporarily for exploring parties. They will never be filled with settlements or cities.)

The case of every separate region whether too hot and dry, or too cold, will have to be diagnosed, which will require a sufficient time of observation, whereupon the proper remedies may be figured out, estimates of cost given, and finally the actual work of improving the climate of the region entered upon.

To bring such efforts into a system, to assemble theories and experience into a practical science, may properly be termed Climaturgery (in analogy with "surgery", "chirurgery", as denoting operative changes, brought about by the hands of man).

Twenty-five years ago there were no automobiles on the streets of Winnipeg nor anywhere else in Canada. During the same number of years also air craft has been brought wonderfully much nearer to perfection and is going steadily forward. Most of our highly useful machinery was very clumsily made in the beginning and working in a slow and troublesome way to start with. Seldom did the first man bring an innovation to perfection, but others in their turn contributed additional ideas, which gradually made the invention or discovery more useful, brought it to a point of perfection, the attainment of which had for a long time seemed questionable or had not even been thought of.

Climaturgery may, and probably will, go through similar stages of development.

Even in the equatorial countries the air is much colder a couple

of miles above the sea level, on mountains and highlands, as well as up in the air above the lowlands. It surely would be a stubborn fact, if there never could be found a way to bring to the overheated lowlands a relief coming from the cooler atmospheric strata as mentioned above.

On April 27th 1929 there was incorporated in Paris, France, a stock company with a nominal capital of 400,000 francs (about $16,000) for the purpose of changing the climate of a part of Northern Africa and converting the sand desert of Sahara into a great ocean. This purpose is to be accomplished through building ranges from the Mediterranean to dried up lakes and stretches of sand lower than the sea surface in southern Tunis, Algier and along the western border of Tripolis. By the means of three such canals 60,000 square miles will be flooded and turned into a permanent lake. The evaporation from this lake is expected to exert a very favorable influence on the climate of Sahara and together with the damming of sweet water rivers from the Atlas mountains and canals for irrigation purposes turn a great part of the desert into land of similar fertility as Tunis and Algier. The first $40,000,000 of stock to be issued is to be used for turning 100,000 square miles of desert into farming land. Later the project is to be extended to the whole of Northern Algier where $400,000,000 will be needed. The interest and profits will be derived from the rent of farms. The lake will have an average depth of 70 feet, something like Lake Winnipeg. A system canal will flood a large part of Tripolis (belonging to Italy). The leading engineer is Dwight Braman of New York, and the French and Italian governments as well as British, American and Italian financiers are interested. The above figures will probably not be the same when once the history of the enterprise is written, and as I have not seen anything more about it for about a year, I don't know whether it has made any further progress. But this great plan is quoted here as a sign that Climatosophy is beginning to loom up as an important branch of human activity for the future.

There may well be other things, than those already mentioned, as the law of moderation of climate caused by human activities, right in our own Canada. After I came to Winnipeg in 1904 I was at first given a room at a hotel together with an elderly Englishman, a merchant in the C. P. R. shops. He told me, that during one of the preceding winters there had been a temperature of 57 below zero right in Winnipeg. "But", he added, "in the shops it was just as warm as usual". Well, about 1906 or 1907 one morning, somewhere around 7 o'clock, I read off exactly 43 below at the corner of Sutter and Dufferin. It has never been either 57 or 43 below zero in Winnipeg since. About ten years ago our morning temperatures used to go down to about 36 below zero. During January 1929 the lowest temperatures were 28 or 29 below zero. With the exception of this winter 1929—1930, this would tend to show that the minimum tem-

perature in Winnipeg goes up approximately 4 degrees every ten years. Of course, you cannot expect this rising tendency to maintain the regularity of a clockwork. But there must be a cause behind it, and this is simply the continuous growth of the city, with its thousands of heat-containing and wind-breaking buildings, furnaces, stoves and lights etc., serving as sources of heat by means of conserving heat. That the innate heat of the growing city is the real source of this gradual change for the better is proven by the fact, that when we had 28 F. in Winnipeg during the winter 1928—29, they had — 46 in the Teulon district, only 45 miles north, and — 48 also in Brandon, 123 miles west of Winnipeg.

The exceptional cold during this winter, 1929—30, must have its cause in immense volumes of warm air moving from one part of the northern hemisphere to the other, as during this same winter the warm weather in Sweden has been even more exceptional than the cold in western Canada. Even during the middle of the winter there has not been enough frost nor snow even in northern Sweden to permit the otherwise regular logging operations nor to haul hay across the swamps.

However what has just been said about Winnipeg seems to establish as a natural rule, that the growth of a large city will bring about a rise of the temperature of the outside air within the city.

Although it really does not belong to the subject of this book, let me say at the same time as a contribution toward the solution of the new acute unemployment problem, that one of the best movements that should be advocated is for people to crowd into large cities, as with the ever more cash system of living in the cities any one who does not receive a steady or otherwise adequate income during the year will sooner or later find himself in distress. Far better would it be for thousands of the present city dwellers (even if they were not able to, and perhaps naturally would not feel inclined to establish themselves as real farmers) to build or procure a home on a smaller piece of land not very far from the city, so that they could get work in the city or in the harvest or elsewhere when there is work to be gotten, but with the aid of their families they could during the summer season raise their own potatoes, vegetables, eggs, perhaps milk and butter etc. At the same time they would avoid a good part of the steady and merciless stream of bills that are inseparably connected with city life. I think this is the best way for many a family to solve the unemployment problem although admittedly this problem cannot be solved in a single way only. I know families more or less outside of fifty miles from Winnipeg who have solved the problem for themselves that way. Some of my childhood years were spent in a district where somewhere around half of the population made their living on these principles, and although the resources there were far behind those of Canada, there was not such an unemployment distress as if those people had been

crowded into a large city and had to pay the bills there, in which case more or less chronic famine conditions soon would have overtaken a considerable percentage of that population.

The provinces of Manitoba and British Columbia are each one like unto a person with a far overgrown head and the body of a baby or a school child, having the people crowded in either case in a large city, with the population of all the rest of the province hardly any bigger. In my high school days it was read to us out of (at least supposedly) medical records, that in India in olden times people used to plant babies in flower pots to make only the head grow and keep the body at baby size. It is difficult to see how they could keep the victim alive at all, but if that really could be done, how could you expect a head like that, or the whole constitution for that matter, to be really healthy?

Whoever is unemployed and thinks he has a better solution for his life's problem, is more than welcome to it. But I am sure that the above suggested solution would at least for a good many lead them into circumstances connected with less worries than they have at present.

But let us return to the climatic question.

Even in the open country there may be an improvent of climate in the way of disappearance of summer frosts. Living in central Minnesota for a few years as a young boy, I heard elderly farmers of those days say, that when they first settled there, damaging night frosts during the summer months were very common, but gradually disappeared, as more and more land came under the plow. Undoubtedly experiences must have been similar in different other districts. Ditching along country roads and elsewhere, drying up of low natural hay meadows gradually during the years, when the grass is cut annually, and the general lessening of superfluous humidity, as a district becomes settled, will contribute to the disappearance of night frosts — if the general summer temperature of the region is not too far below the limit of such possibilities.

Cold and Warm Houses.

How often have you not heard expressions like this: "That is a cold house" — "Our house is cold", etc.! People seem to take it for granted, that when a house is cold, there is nothing to do but to fire, to help matters as far as the influence of the fire reaches (sometimes it is hot around the stove and cold in the far corners) and then shiver for the rest of it — or else, as a radical permanent remedy, to move away altogether, or possibly go to the expense of building a new house on the same premises. The latter may be an ideal way, if you can afford it. But if I have sized up the world fairly correctly, the great majority of people are not financially ready to build a new house in place of the old one. On the other hand, the house there

is, would not be so bad, if it only were somewhat warmer. But comparatively few people there seem to be, who conceive the idea of making their living house warmer through simple means, although often from $10 to $25 (or an insignificant sum anyhow) of tar paper, building paper, plaster board, seal-o-felt, or a combination of more than one of these remedies, or by improving the foundation, roof, heating apparatus, banking with snow in the winter, planting of evergreen windbreaks, etc., would make a wonderful difference, and the work, being of a simple nature, could be done entirely or mostly by the residing party, with little or no cash expense in wages. I have practised this myself, making cold houses warm where I lived, so I know what I am writing about, although my regular occupation has not been in the building trade. (In this connection I do not refer to the large and wellbuilt residences of the well to-do members of the community, nor brick blocks or public buildings in general, but just smaller residences of the common people in the country as well as in the cities.)

In the same way as people generally seem to take it for granted, that a house, once built, must remain as it is, warm or cold, — with the same logic, but still more firmly, they also take for granted that the climate of a certain country is absolutely unchangeable through human efforts. When theory and practice combined once succeed in overturning this idea, a great step forward will have been taken toward increasing the happiness of many millions of human beings.

A Pointer as to Tree Planting.

Why are our streets and public places planted so nearly exclusively with such trees that lose their leaves in the fall, thereby giving the winter landscape such a dreary and forlorn aspect? It takes a certain method and special care to make evergreens grow on the prairies and in some other soils. But when they can be made to thrive at some places, why can't they adorn our grounds all over, making Canada more home-like and beautiful and less of a pronounced winter country!

In the early winter of 1920 I spent a short time in Sheldon, Iowa, a town of about 6,000 inhabitants, or something like Portage la Prairie. In the vicinity of my rooming place there were two tall pine trees, perhaps a hundred feet apart, with beautiful, lofty, dominating crowns. It was just an ordinary town, but those stately green pines added a distinct element of beauty to it.

A young woman coming to Canada from Siberia three or four years ago wrote in a letter to a Winnipeg weekly, that her heart was yearning for the beautiful forests of her homeland. I thought it was a wonder that anybody could long back to Siberia, even then, to say nothing of the present time. But my next thought was: There must have been evergreen trees in those forests!

Closing Remarks.

Many a book starts with a "preface", containing remarks of a more personal nature, regarding circumstances of publication, sources of information, etc. After this booklet has been read to the end, perhaps a few such remarks may be better understood than if they were made in the beginning. On the one hand they may not be absolutely necessary, on the other hand they may serve to answer natural side questions that may occur to the reader's mind, and may do no harm.

This booklet has been written by a man, whose personal circumstances gave him only an hour now and then during some evenings to devote to this work. The necessary direct forestudies occupied about two years of similar sparetime, as it was necessary to get as clear an understanding as circumstances would permit of the climatic and topographical conditions of the different parts of Canada, especially as there was no adequate opportunity to travel in the distant northerly or westerly regions of the country. The passion for studying and comparing climates, from lonely islands out in the oceans to the worlds largest countries (in connection with other geography, natural resources and national economy) has been present in the writer's mind since boyhood days, seemingly without much advantage to himself or anyone else. However, if here could be found the initiative or the small beginning of the way to remove the only serious natural handicap of this great country, Canada, the studies in this direction may not have been in vain.

Some of the readers may know different details, here presented, far more thoroughly than the writer does, by virtue of having lived in the provinces or countries here mentioned or having been occupied with work herein referred to. If information here presented therefore seems either scanty or unnecessary to such a reader, it may still be useful to other readers who have a lesser knowledge of the details in question than the writer has, and also for the general conception of the subject here treated.

Of the main subject of this booklet, viz. the possibility of improving the climate of Canada, one thing is sure: Thousands of Canadians will consider this matter very thoroughly; and difficulties, that are not entirely prohibitive, will be mastered sooner or later through co-operation of many brains and minds working out the different details.

If the Canadian people will bring this problem to a successful solution, they will stand out before the world as a nation of greater calibre than if they never had such a problem to solve.

Winnipeg, in March 1930.

J. DALSTROM.

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